

Kamstrup 351

Generation C

DATA SHEET

- **Current transformer meter**
 - **Apparent power values per phase and total (KVA, PF)**
 - **Voltage Quality Measurements**
 - **Optimized for Smart Metering systems**
 - **Secured against tampering**
 - **Resistant to errors in the supply network**
 - **Ultra-low power consumption**
 - **Built-in radio communication**
 - **Transformer ratio up to 3000A/5A**
- **Type approved according to:**
 - Active energy
EN 50470-1 (MID)
EN 50470-3 (MID)
 - Active energy and reactive energy
IEC 62052-11
IEC 62053-22
IEC 62053-23



Application

K351C is a 3-phased current transformer electricity meter for registration of electric energy. The meter is full electronic without movable parts. Thus, energy registration is not affected by shock or impact during transport and mounting. Furthermore, measurements are correct, no matter the physical mounting direction.

Energy is determined by simultaneously measuring voltage and current. The current is measured via current transformers.

The easily readable display scrolls automatically between readings, or readings can be changed manually by activating the left push button. The required display readings as well as their order are configurable.

In addition to being read from the display, data can be collected via Radio

Mesh Network, Optical output or from the module area. The unique module area also permits external changing of tariffs, pulse inputs and outputs, and configuration as well as a wide range of communication media.

A Consumer Communication Channel is available for data exchange with Smart Home products.

From the factory, the meter can be configured to measure both imported and exported energy. The meter makes accurate measurements whether it measures 1, 2 or 3 phases. Measurements are saved in a permanent memory.

Kamstrup 351C can generate load profiles in all four quadrants.

A load profile provides detailed information about consumed and

produced energy. An additional logger with 16 channels contains data for analysis purposes.

Voltage quality measurement consists of voltage measurement, registration of maximum and minimum voltage, overvoltage and undervoltage as well as voltage failures. All registrations take place per phase.

In order to minimise the manual configuration during installation, the meter is preconfigured from the factory. Furthermore, the meter can be reconfigured via a Smart Metering system.



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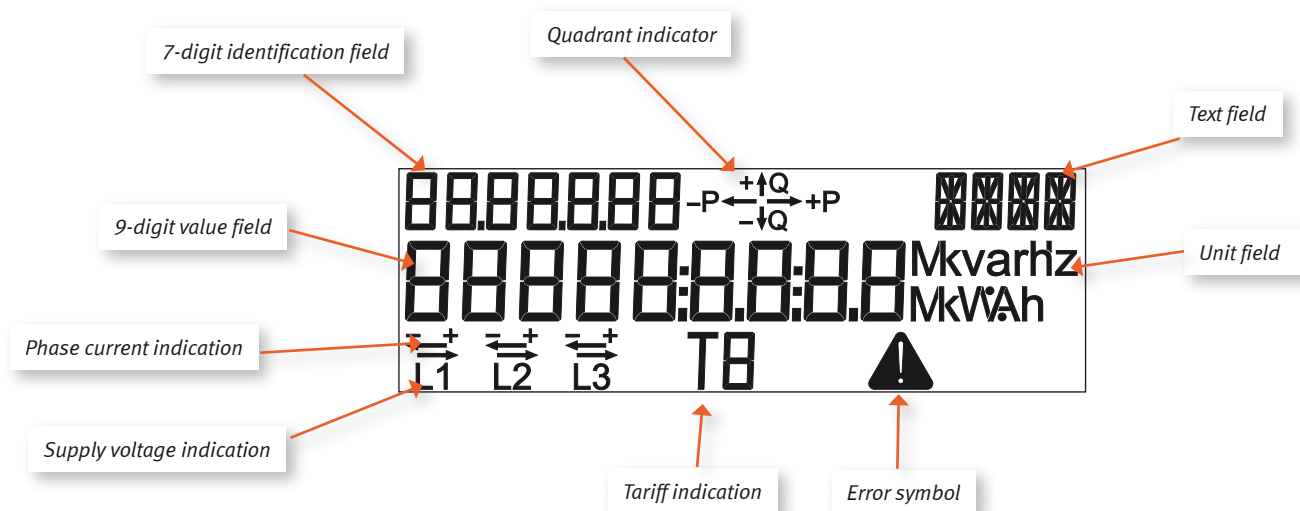
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Functions

Display

Kamstrup 351C is provided with a Liquid Crystal Display (LCD). The registers that can be read from the display depend on the chosen configuration. It is also possible to remotely configure the display.

The display configuration is constructed as three independent display lists: One for automatic shift function, one for manual shift function and one for back-up-powered shift function. The display is constructed of segments as shown in the figure below.



9-digit value field:

This field is used for displaying register values.

Unit field:

This field is used for displaying the units that are related to the value field.

7-digit identification field:

OBIS code identification of the value in the value field.

Quadrant indicator:

Indicates the current load type.

Text field:

Contains additional text in connection with the meter's function.

Error symbol:

Indicates critical internal errors, magnetic influence or opening of meter cover.

Tariff indication:

Indicates the current tariff if tariffs have been selected.

Supply voltage indicator:

Indicates whether mains is connected for each phase.

Phase current indication:

Indicates current direction for each connected phase.

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Functions

Display

The automatic shift function (scroll) changes between the selected readings every 10 seconds. Historical data cannot be selected in the automatic shift function. Up to 16 readings can be selected.

The manual shift function changes through activation of the left push button. Up to 30 readings and the reading order can be selected. However, it is not possible to deselect the **legal** readings.

If the back-up-operated shift function is selected, it becomes possible to read the display, also when the meter is not power supplied. Up to 8 readings can be selected, and shifts between readings are made by activating the left push button.

The meter automatically returns from manual shift function to automatic scroll function two minutes after the last activation of the left push button.

Energy reading

Kamstrup 351C has one current transformer per measuring system and resistance division for voltage measurement.

Energy consumption is calculated as an expression of the current compared to the phase voltage and time.

The energy registration per measuring system is communicated to the meter's legal processor via the meter's own internal bus system and is summed in the meter's main registers.

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Permanent memory

Measured and calculated data are stored in the meter's permanent memory. Data are stored by every change of energy register values.

Furthermore, the below mentioned values are stored at the end of a debiting period:

Various	Energy registers	Power registers
Date	Active positive primary energy A+	Peak power P+max
Time	Active negative primary energy A-	Peak power P+max Date
RTC/Quality info	Reactive positive primary energy R+	Peak power P+max Time
Hour counter	Reactive negative primary energy R-	Peak power P+ max RTC
Debiting stop counter	Active positive primary energy A+ Tariff 1	Accumulated peak power P+max acc
Power threshold counter (A+)	Active positive primary energy A+ Tariff 2	Accumulated peak power P+max acc Tariff 1
Pulse input	Active positive primary energy A+ Tariff 3	Accumulated peak power P+max acc Tariff 2
Current transformer ratio	Active positive primary energy A+ Tariff 4	Peak power Q+max
	Reactive positive primary energy R+ Tariff 1	Peak power Q+max Date
	Reactive positive primary energy R+ Tariff 2	Peak power Q+max Time
	Reactive positive primary energy R+ Tariff 3	Peak power Q+ max RTC
	Reactive positive primary energy R+ Tariff 4	Accumulated peak power Q+max acc
		Peak power P+max Tariff 1
		Peak power P+max Tariff 1 Time
		Peak power P+max Tariff 1 Date
		Peak power P+ max Tariff 1 RTC
		Peak power P+max Tariff 2
		Peak power P+max Tariff 2 Time
		Peak power P+max Tariff 2 Date
		Peak power P+ max Tariff 2 RTC
		Peak power Q+max Tariff 1
		Peak power Q+max Tariff 1 Time
		Peak power Q+max Tariff 1 Date
		Peak power Q+ max Tariff 1 RTC
		Peak power Q+max Tariff 2
		Peak power Q+max Tariff 2 Time
		Peak power Q+max Tariff 2 Date
		Peak power Q+ max Tariff 2 RTC
		Peak power S+max
		Peak power S+ max RTC
		Peak power S-max
		Peak power S- max RTC

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Functions

Plug-in modules

Kamstrup 351C can be mounted/retrofitted with plug-in modules without subsequent reverification.

The module communicates with the meter's microprocessor via an internal data bus. This provides innumerable functional possibilities such as extra pulse output, tariff, load control and data communication via e.g. GSM/GPRS, TCP/IP and Wireless M-Bus.

Optical reading

An optical sender/receiver is placed on the front of the meter. This optical connection can be used to read data or configure e.g. display set-up, meter number and other settings.

Changes via the optical connection can be made by using the software program METERTOOL.

It is not possible to change the meter's legal data.

S0 pulse output

Emits pulses of secondary active energy at 5000 pulss per kWh. The maximum voltage, which may be connected to the S0 output, is 27 V DC (at 1 k Ω), and the maximum current, which can be ddrawn through the output, is 27 mA. The pulse time is 30 msec.

Load profile

Load profiles can be configured to 5, 15, 30 or 60 min. according to the integration period and for all four quadrants. The number of generated profiles corresponds to the selected energy type for the meter.

Integration period Energy type	5 min. days	15 min. days	30 min. days	60 min. days
A+	92	275	550	1100
A+/A-	77	231	462	924
A+/R+	77	231	462	924
A+/A-/R+/R-	58	175	350	700

Analysis logger

Kamstrup 351C is provided with a configurable analysis logger. The logging depth is depending on the configuration of the meter as well as the number of registers. The analysis logger can register data from up to 16 different registers at a time. Kamstrup 351C is available with default setting which can be reconfigured subsequently via METERTOOL or a Smart Metering system.

Tamper proof

Apart from the mechanical sealing, the meter also reveals tampering (including opening of the meter cover). In case of attempts of tampering (mechanical or magnetic), an alarm is activated which is time and date stamped and saved to the permanent memory. Alarms can be automatically transferred via the communication infrastructure and, indicated on the display.

Voltage quality measurments

The voltage quality measurement consists of voltage measurement, registration of maximum and minimum voltage, overvoltage and undervoltage as well as voltage failures. All registrations take place per phase.

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Approvals

Kamstrup 351C is type approved according to the Measuring Instruments Directive (MID) for active energy and according to the national requirements for other energy types, where required.

Approval	Norm
Type test according to:	
– Active energy	EN 50470-1 EN 50470-3
– Reactive energy and active energy	IEC 62052-11 IEC 62053-22 IEC 62053-23

Various	Norm
Terminal	DIN 43857
S0 pulse output	DIN 43864
Optical reading	EN 62056-21
OBIS/EDIS codes	IEC 62056-61
Interface classes	IEC 62056-62
Data link layer	IEC 62056-72

Technical data

Measuring principle	
– Current	Single-phased current measurements via current transformers
– Voltage	Single-phased voltage measurements by voltage divider
Nominal voltage U_n	3x230 VAC -20 % - +15 % (for Aron meter only) 3x230/400 VAC -20 % - +15 %
Maximum voltage U_{max}	3x230V +20% (only applies to Aron meter) 400V +20% between any of the main terminals (L1, L2, L3, N)
Current	$I_{min} - I_n (I_{max})$ 0.05 - 5(6)A
Accuracy class	Class 1 (IEC) / Class B (MID) Class 0.5 (IEC) / Class C (MID) Reactive energy: class 2 (IEC)
Nominal frequency f_n	50 Hz $\pm 2\%$ or 60 Hz $\pm 2\%$
Phase displacement	Unlimited (however, not for Aron meters)
Operating temperature	-40°C - +70°C
Storage temperature	-40°C - +85°C
Protection class	IP54
Protection class	II

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Technical data

Relative humidity	< 75 % year's average at 21°C < 95 % less than 30 days/year, at 25°C
Weight	0,90 Kg
Application area	Indoors or outdoors in suitable meter cabinet
Own consumption	
– Current circuit	0,02 VA
– Voltage circuit	0,2 VA 0,1 W
Materials	Glass reinforced polycarbonate
Data storage	Permanent memory, > 10 years without voltage
Display	LCD, 7 mm digit height (value field) LCD, 5 mm digit height (OBIS-field, Text-field and Tariff readings) LCD, 3 mm digit height (voltage and power readings)
Meter constant	10000 imp/kWh
S0 pulse diode	10000 imp/kWh, kvarh Pulse time 30ms ± 10 %
S0 pulse output	5000 imp/kWh Pulse time 30ms ± 10 %
Real Time Clock (RTC)	
Accuracy	Typically 5 ppm at 23°C
Backup	Battery life > 10 years at 23°C Supercap life > 10 years at 23°C
Supercap operating time	7 days fully charged

Connections

Main terminals

Size	2.5 – 10 mm ² elevating connections
Screws	Ph2 or (4x1) straight slot
Torque	2.5 – 3 Nm

Voltage outputs

Size	0.25 – 1.5 mm ² , 5 mm cable terminal forks
Screws	TORX Tx 10
Torque	1Nm

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Communication

Kamstrup 351C can be supplied and retrofitted with communication modules. The modules function as inputs and outputs for the meter. Mounting of modules does not require subsequent verification of the meter.

Communication Modules

S0 supply	Sends 24 V via a 2-wire and pulses by drawing the voltage to 0 V at each pulse. Can supply e.g. MULTICAL®.
Serial	Serial RS-485 or RS-232 communication or current loop with pulse inputs, tariff inputs or load control.
M-Bus	Reading via wireless or wired M-Bus system.
TCP/IP	Collection of consumption data via TCP/IP communication.
GSM/GPRS	Collection of consumption data via GSM/GPRS communication. Supports SMS reading.

Integrated radio

Kamstrup 351C can be provided with built-in radio communication for Kamstrup Radio Mesh Network. Radio communication therefore requires no mounting/retrofitting of communication module. If the meter's module area is used for another type of communication, the built-in radio communication can be deactivated.

CCC-module

In Kamstrup 351C it is possible to mount a CCC- (Consumer Communication Channel) module. The module can be used for communication and data exchange with Smart Home products such as energy displays and external relays. The CCC-module is mounted without using tools or breaking the seal of the meter. The mounting may be done by e.g. the consumer himself.

Transformer ratio

The transformer ratio in the Kamstrup 351C can be configured depending on the current transformer installed with the meter.

The ratio can be configured from 5/5A to 3000/5A without reverifying the meter.

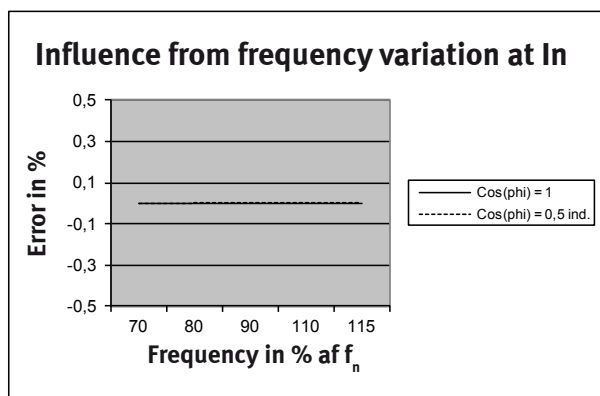
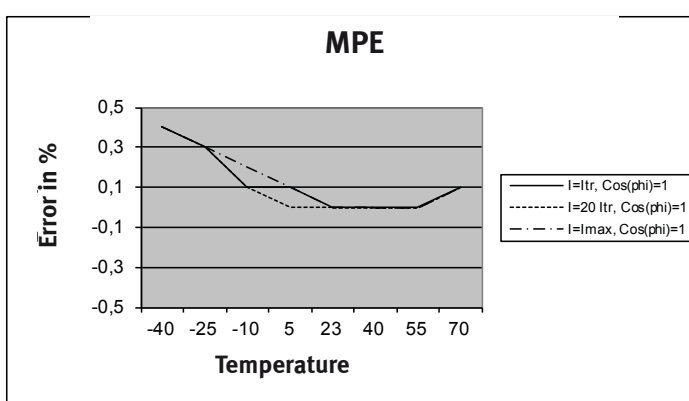
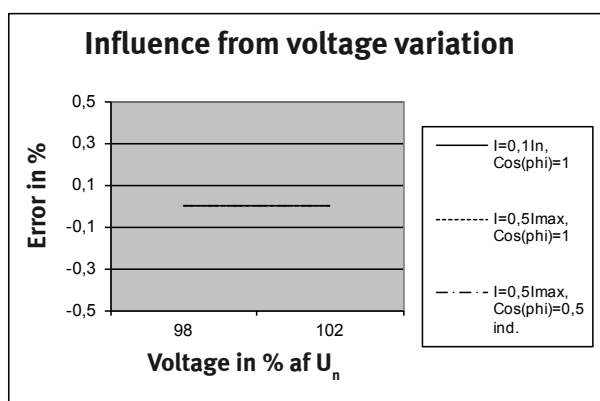
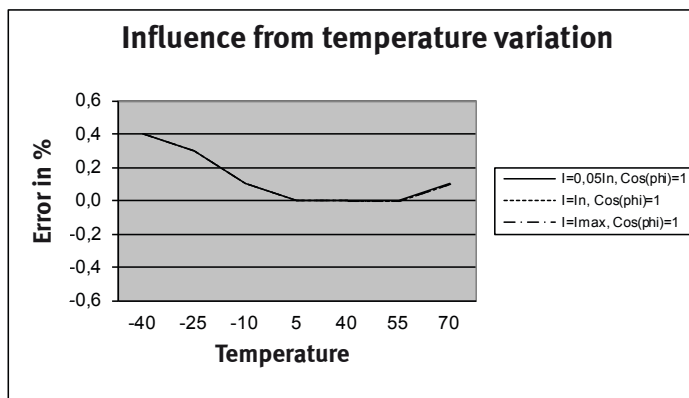
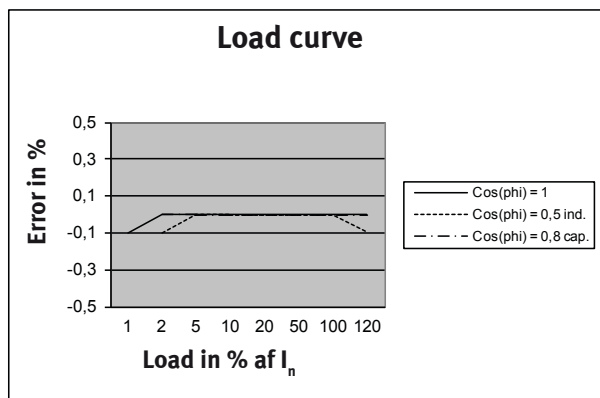
The primary energy is displayed in the display when entering the transformer ratio of the current transformer. The secondary energy reading always indicates the total consumption for the energy types chosen.

Changes in the ratio are stored in the permanent memory of the meter.

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Typical accuracy charts



MPE (Maximum Permissible Error)

Error composed of:

- current load
- voltage variation
- frequency variation
- temperature variation

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Ordering details

	685-	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇	X ₈ X ₉ X ₁₀
X₁ Phases									
3x 230V (Aron) / 50 Hz		2							
3x 230/400V / 50Hz		3							
3x 230/400V / 60Hz		4							
X₂ Current									
In 5(6)A			5						
X₃ Class									
Class B (reactive class 2)				B					
Class C (reactive class 2)				C					
Class 1 (reactive class 2)				1					
Class 0.5 (reactive class 2)				5					
X₄ Generation									
C					C				
X₅ Energy type									
A+						1			
A+/A-						2			
A+/R+						3			
A+/A-/R+/R-						4			
X₆ Hardware option									
Supercap and battery							2		
Kamstrup RF, supercap and battery							5		
X₇ Tariff configurable									
Configurable								3	
X₈X₉X₁₀ Country code									
Denmark	DK								010
Russia	RU								025
Spain	ES								031
Croatia	HR								036
Norway	NO								040
Latvia	LV								045
Lithuania	LT								049
Great Britain	UK								050
Austria	AT								055
Switzerland (Italian part)	CH (IT)								059
Estonia	EE								061
Switzerland (German part)	CH (DE)								063
Poland	PL								064
Switzerland (French part)	CH (FR)								065
Iceland	IS								067
Germany	DE								070
Belgium	BE								078
The Netherlands	NL								080
Finland	FI								084
Sweden	SE								090
Saudi Arabia	SA								110
South Africa	ZA								120
Chile	CL								151

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Configuration 1 (A-B-CCC-DD-E)

	A	B	CCC	DD	
A Decimals in display					A Decimals displayed (locked)
7.0 Primary energy	1				
7.1 Primary energy	2				B LED configuration (locked)
7.2 Primary energy	3				
B LED configuration					CCC Module
LED switched off without consumption		1			
LED switched on without consumption		2			DD Input/output configuration
CCC Module, connection to module	I/O 1	I/O 2			
No module,	-	-	000		
S0-supply module	-	Output	001		
Tariff control, 4 tariff, 230V input	Input	Input	008		
Tariff control, 4 tariff, 230V input, Current loop	Input	Input	018		
IP101i, TCP/IP module	Input	-	040		
GSM8i ; GSM8i/RF ; GSM8i/2x5A Load control	See module data sheet		053		
Pulse input and load control module	Input	Output	055		
Load control module, 5A	Input	Output	058		
Wireless M-Bus module	Input	-	064		
M-bus module, 8pins with secondary adresssing	Input	Input	068		
Load control module, 2 x 5A	Output	Output	069		
MUC module			071		
RS-485 module, multidrop	Input	Output	072		
Data/pulse module, dual pulse, 9600	See module data sheet		075		
DD Input/output configuration	I/O 1	I/O 2			
No function	-	-		00	
4-tariff	Input	Input		01	
4-tariff inverted	Input	Input		02	
Pulse in / alarm in	Input	Input		03	
Pulse in / inverted alarm in	Input	Input		04	
Pulse in / A+ out	Input	Output		05	
R+ out / A+ out	Output	Output		06	
2-tariff / alarm in	Input	Input		07	
2-tariff inverted / alarm in	Input	Input		08	
2-tariff / alarm in inverted	Input	Input		09	
2-tariff inverted / alarm in inverted	Input	Input		10	
2-tariff / A+ out	Input	Output		11	
2-tariff inverted / A+ out	Input	Output		12	
Pulse in / 2-tariff	Input	Input		13	
Pulse in / 2-tariff inverted	Input	Input		14	
Debiting stop / -	Output	-		15	
A- out / A+ out	Output	Output		16	
Load control / Load control status	Input	Output		17	
Pulse in / Load tariff sync	Input	Output		18	
Pulse in inverted / Load tariff sync	Input	Output		19	
Pulse in / Load tariff sync inverted	Input	Output		20	
Pulse in inverted / Load tariff sync inverted	Input	Output		21	
4-tariff sync load control	Output	Output		22	
4-tariff sync load control inverted	Output	Output		23	
Load control 1 / Load control 2	Output	Output		26	
Pulse in / Load control	Input	Output		27	
Pulse in / Toggle Load control 1 & 2	Input	Output		28	

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Configuration 2 (FFF-GG-HH-I)

E Integration period
FFF Display configuration –
 Contact Kamstrup A/S for further information
GG Target date

E **FFF** **GG**

E Integration period

5 min.
 15 min.
 30 min.
 60 min.

FFF Display configuration

Contact Kamstrup A/S

GG Target date

Externally controlled	00
1.	01
2.	02
3.	03
4.	04
5.	05
6.	06
7.	07
8.	08
9.	09
10.	10
11.	11
12.	12
13.	13
14.	14
15.	15
16.	16
17.	17
18.	18
19.	19
20.	20
21.	21
22.	22
23.	23
24.	24
25.	25
26.	26
27.	27
28.	28

HH Debiting logging interval
I Pulse output length/Alarm input

HH **I**

HH Debiting logging interval

None (externally controlled)	00
Monthly	01
Every second month, January	02
Every second month, February	03
Every third month, January	04
Every third month, February	05
Every third month, March	06
Half-yearly, January	07
Half-yearly, February	08
Half-yearly, March	09
Half-yearly, April	10
Half-yearly, May	11
Half-yearly, June	12
Yearly, January	13
Yearly, February	14
Yearly, March	15
Yearly, April	16
Yearly, May	17
Yearly, June	18
Yearly, July	19
Yearly, August	20
Yearly, September	21
Yearly, October	22
Yearly, November	23
Yearly, December	24

I Pulse output length/Alarm input

30 msec pulse output length, no alarm	1
30 msec pulse output length, alarm	2
80 msec pulse output length, no alarm	3
80 msec pulse output length, alarm	4

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Configuration 3 (JJ-K-LL-M-NN-OOO-PPP-QQ)

	JJ	K	LL	M	NN	OOO	PPP	QQ	
JJ Not available									JJ Not available
None	00								K Not available
K Not available									LL GMT
None		0							M Pulse output (module port)
LL GMT									NN Unit pulse input
0 London			00						OOO Tariff control table/ Table for Non working days and public holidays
1 DK, DE, FR, ES, NO, SE			01						
2 FI			02						
3			03						
4			04						
5			05						
6			06						
7			07						
8			08						
9			09						
10			10						
11			11						
12			12						
-11			13						
-10			14						
-9			15						
-8			16						
-7			17						
-6			18						
-5			19						
-4			20						
-3			21						
-2			22						
-1			23						
M Pulse output (module port)									
Pulses for secondary energy				0					
Pulses for primary energy				1					
NN Unit pulse input									
None				00					
kWh				01					
m³				02					
L				03					
OOO Tariff control table									
Contact Kamstrup A/S						XXX			
PPP Summer/normal time table									
None							000		
001 EU							001		
QQ Load profile, based on:									
Primary energy								01	
Secondary energy								02	

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Configuration 5 (RRR-SSS-T-U)

	RRR	SSS	T	U
RRR RF code				
None	000			
CH 318 RF	318			
EU 319 RF	319			
SE 327 RF	327			
SE 328 RF	328			
NO 339 RF	339			
DK 348 RF	348			
DK 349 RF	349			
FI 359 RF	359			
PL 369 RF	369			
SSS Transformer ratio				
5A / 5A		001		
10A / 5A		002		
15A / 5A		003		
20A / 5A		004		
25A / 5A		005		
30A / 5A		006		
35A / 5A		007		
40A / 5A		008		
45A / 5A		009		
50A / 5A		010		
100A / 5A		020		
200A / 5A		040		
300A / 5A		060		
400A / 5A		080		
500A / 5A		100		
1000A / 5A		200		
1500A / 5A		300		
2000A / 5A		400		
2500A / 5A		500		
3000A / 5A		600		
T Transformer ratio (configurable or locked)				
Configurable			1	
Locked			2	
U Debiting logger 2, based on:				
Daily values				1
Weekly values				2
Monthly values				3

RRR	RF Code
SSS	Transformer ratio
T	Transformer ratio (configurable or locked)
U	Debiting logger 2, based on:

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Installation

Connect the meter in accordance with the installation diagram on the meter's type label.

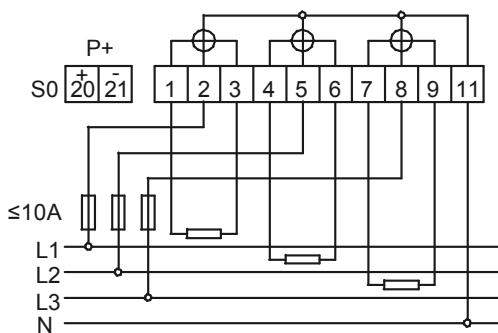
Depending on the configuration, a fixed value will be displayed, or the display will change automatically between selected indications every 10 seconds.

It is possible to change the display reading manually by activating the left push button on the meter. The available readings will depend on the meter's configuration.

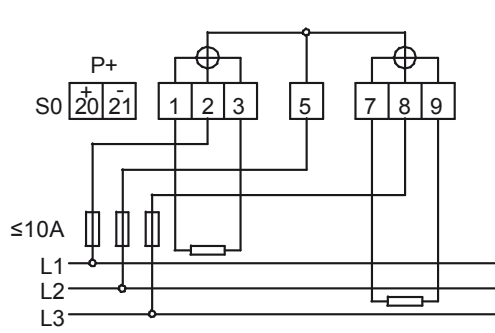
Connection diagrams

The valid connection diagram appears from the type label on the front of the meter.

3-phase, 4-wire



3-phase, 3-wire (Aron)



Safety and installation guidelines

The meter shall only to be used for measuring electrical energy and shall operate within the specified values only.

The meter must be switched off when working on it. It can be highly dangerous to touch connected meter parts.

Current local standards, guidelines, regulations and instructions must be observed. Only authorized personnel are permitted to install electricity meters.

Meters for direct connection must be protected against short circuit by a backup fuse in accordance with the maximum current stated on the meter.

The relevant backup fuse must therefore be removed and kept in a place where it cannot be inserted by unauthorized personnel.

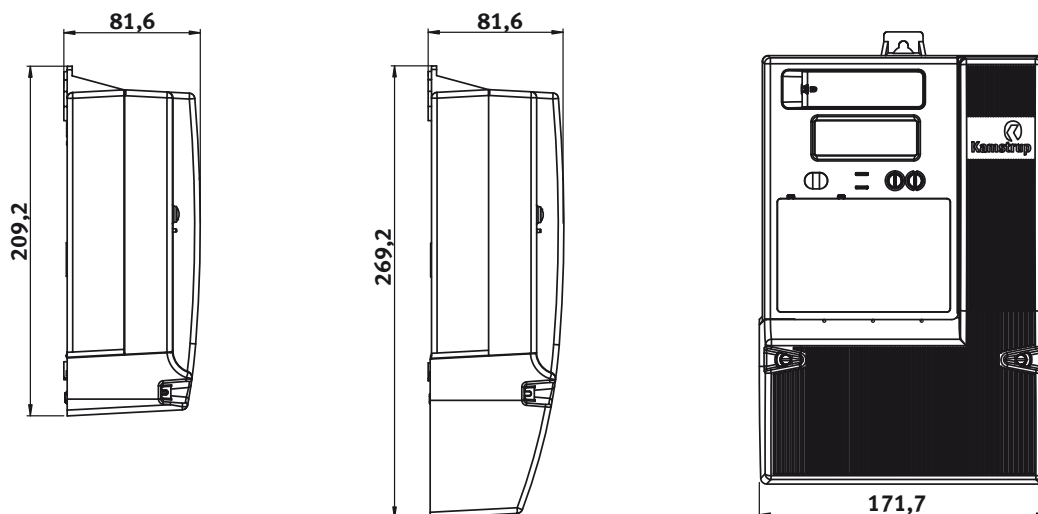
The meter constant LED flashes proportionally to the consumed active energy.

Only authorized personnel must break the utility sealing.

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Dimensions



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Accessories

Modules

S0 supply module	68 50 001
Tariff control, 4 tariff, 230V input	60 50 008
Tariff control, 4 tariff, 230V input, current loop	60 50 018
IP101i, TCP/IP module	68 50 040
GSM8i, GSM8i/RF, GSM8i/2x5A Load control	68 50 053
5A Load control module	68 50 058
Wireless M-Bus	68 50 064
M-Bus module, 8 pins with secondary addressing	68 50 068
2 x 5A load control modules	68 50 069
MUC module	68 50 071
RS485 module, multi drop	68 50 072
Data/pulse module, dual pulse, 9600	68 50 075

Software

Configuration SW, METERTOOL	68 99 580
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Various

Standard meter cover	59 60 370
Long meter cover, 60mm	59 60 316
Optical reading head with USB plug	66 99 099
Optical reading head with 9-pole D-sub connector	66 99 102
METERTOOL kit for CT ratio programming	68 30 017

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